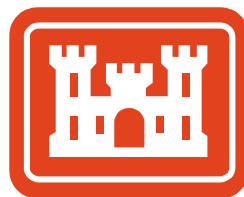


NORTH PARK LAKE ECOSYSTEM RESTORATION PROJECT

HANGING BAG TEST FINAL REPORT

For:
U.S. Army Corps of Engineers



**Pittsburgh District
Pittsburgh, Pennsylvania**

By:
Gannett Fleming, Inc.
Pittsburgh, Pennsylvania
and



Contract DACW59-02-D-0006
Task Order 0003

August 2003



Gannett Fleming

GANNETT FLEMING, INC.
Foster Plaza III
Suite 200
601 Holiday Drive
Pittsburgh, PA 15220

Office: (412) 922-5575
Fax: (412) 922-3717
www.gannettfleming.com

August 6, 2003

U.S. Army Corps of Engineers, Pittsburgh District
Attn: Mark Vollmer, P.E.
Wm. S. Moorhead Federal Building, Room 727
1000 Liberty Avenue
Pittsburgh, Pennsylvania 15222-4186

Subject: Contract No. DACW59-02-D-0006, Task Order 003
North Park Lake Dredging – Hanging Bag Test
Final Letter Report

Dear Mr. Vollmer,

We are pleased to submit four (4) paper copies and one (1) electronic copy via compact disk of the Final Report for the North Park Lake Hanging Bag Test. The report has been prepared by our sub consultant testing laboratory, Geotechnics, Inc., and has been reviewed by Gannett Fleming, Inc. We concur with the findings of the report.

Please note that the samples collected for this test were obtained from the bank of North Park Lake in accordance with Modification 1 to the Task Order Agreement. The material comprising these samples may differ from the dredge material to be removed from the lake bottom and the results presented herein may vary from the material encountered during the dredging operation.

If you have any questions or require additional information, please contact me at (412) 922-5575.

Very truly yours
GANNETT FLEMING, INC.

John W. Kovacs, P.E., PMP
Project Manager

Encl.

July 31, 2003

Mr. John Kovacs
Gannett Fleming
Foster Plaza III, Suite 200
601 Holiday Drive
Pittsburgh, PA 15220

Hanging Bag & Geotechnical Test Results
North Park Lake Project
U. S. Army Corps of Engineers, Pittsburgh District
Pittsburgh, Pennsylvania

Dear Mr. Kovacs,

Geotechnics has completed the Hanging Bag Test for the North Park Lake Project for the U. S. Army Corps of Engineers, Pittsburgh District. In general our Scope-of-Work included sample collection, sample preparation, polymer compatibility testing, the hanging bag test and selected geotechnical testing. The following information details the various tasks performed by Geotechnics. The geotechnical test results are discussed below and are attached.

Sample Collection

Geotechnics personnel traveled to the North Park Lake site and collected lake water and lake sediment samples from the boat dock area. A total of fifteen (15) five-gallon buckets were utilized for sample containers for both the sediment and the water. The water samples were collected at the waters edge by submerging the buckets until they were filled. The buckets, similar to five-gallon paint containers, were then sealed with snap type, clamping lids. A total of ten (10) buckets of water were collected.

The lake sediment samples were also collected at the boat dock area by wading into the lake and using a shovel to scoop the sediment from the lake bottom. The collected sediment was placed in five (5) additional buckets labeled (S1-S5) and then sealed. All of the samples were transported to our facility by truck.

Initial Sample Preparation

The sediment sample was prepared by combining buckets 1 and 3 together to have enough material to perform the requested geotechnical testing following the hanging bag test. Initially, a water/sediment sample was prepared in a five-gallon bucket to be used for the polymer testing. The sediment was added to the lake water to obtain a solid concentration that was between 130-150 grams per liter (g/L) as per the scope of work requirements. Once the material was placed in the bucket a mixer was utilized to mix the materials. Several samples were collected during the mixing from a sample port along the side of the bucket to verify the percent solids.

Polymer Testing

The polymer testing was conducted on lake water and solids mixed in a five-gallon bucket simulating the potential dredged material from North Park Lake. Two products were selected from two manufacturers for the polymer testing. The first product was manufactured by Chemtall and distributed by Neo Solutions, Inc. located in Pittsburgh, Pennsylvania. The second product was manufactured by Cytac and distributed by Shereton Soft Water located in Buffalo, New York.

Several issues were considered when selecting the polymers. They included;

- **Product/ Treatment Toxicity** - Because North Park Lake and the surrounding stream is a public fishing location cationic type polymers were not seriously considered due to their high potential toxicity to fish. Cationic materials were not considered due to the negative reaction to fish gills which would most likely kill the fish. Only anionic products were tested for this phase. Anionic products are available in both powder or emulsion (liquid) forms. Both powders and emulsions must be mixed with water prior to being added to the dredged material. With the emulsion product (white liquid), surfactants are added to emulsify the product, which produces the liquid state. Based on the cost of the emulsion product, the powder form was utilized.
- **Ease of Product Use** - The emulsions are the easiest materials to handle and can be added directly to the dredged material following mixing with water. The powders require approximately 30 minutes of preparation time (powder to water mixing) prior to being introduced into the dredged stream. Typically a powder is 100% active while an emulsion is 33% active.
- **Rate of Dewatering** - The tests were conducted by treating the dredge stream with various dosages then pouring the material through a section of the geotube material (hanging bag) that was placed on the bottom of a funnel flask. The dewatering was observed and timed and the data is presented in a table below. The data obtained indicates the various products ability to drain the water through the bag material from the dredged material. However, it should be noted that this procedure allowed for dewatering to occur from below only, whereas, the actual hanging bag test will promote dewatering along its entire surface.
- **Water Clarity** - Turbidity tests were performed on all the samples that were passed through the bag material. In some cases a small amount of material passed through the bag, this was noted on our raw data results.

Polymer Test Results

The following table presents the data that was collected during the polymer testing. Photographs taken during the polymer testing are also attached.

Distributor		Neo Solutions	Neo Solutions	Neo Solutions	Neo Solutions	Neo Solutions	Neo Solutions	Neo Solutions	Shereton Soft Water	Shereton Soft Water
Product		6950	6950	6950	6950	6550	6550	6450	A120	A130
Manufacturer		Chemtall	Chemtall	Chemtall	Chemtall	Chemtall	Chemtall	Chemtall	Cytec	Cytec
Dosage		60 ppm	80 ppm	120 ppm	160 ppm	120 ppm	200 ppm	450 ppm	120 ppm	120 ppm
Polymer Form		Powder	Powder	Powder	Powder	Powder	Powder	Emulsion	Powder	Powder
		Time (in seconds)								
Volume passing filter	50 ml	15.0	4.5	2.0	3.2	8.5	4.0	6.8	5.9	2.9
	100 ml	36.9	17.9	7.3	21.5	31.2	12.9	16.6	23.9	13.7
	150 ml	65.0	39.1	13.7	42.8	71.5	27.5	32.7	59.4	28.5
	200 ml	99.0	71.0	21.9	74.7	127.0	46.7	53.1	2.1	52.3
	205 ml	136.0								
	220 ml									1.12
	230 ml						68.0	73.0		
	240 ml			60.0						
	245 ml					245.0				
	250 ml				119.0					
	280 ml				154.0					
Turbidity		566 NTU	104 NTU	93 NTU	84 NTU			79 NTU	230 NTU	93 NTU

The initial testing was performed with the Neo solutions #6950. Various dosage rates were utilized to fine tune the required amount of polymer to be added. The Neo Solutions product #6550 was then tested at two different doses followed by an Emulsion #6450 for dosage comparisons. Two similar products from Shereton Soft Water were then tested at 120 ppm. In general, the test results above indicate that the Neo Solutions, Inc. product #6950 applied at 120 ppm allows the dredged material to flow through the bag the fastest while the filtrate indicates a turbidity of 93 Nephelometric Turbidity Units (NTU). However, Shereton Soft Water product #A130 indicated similar results. The Neo Solutions, Inc. product #6950 at a concentration of 120 ppm was used for the hanging bag test.

The Hanging Bag Test

The Hanging Bag test was generally performed to the method presented in the Miratech video. The following information details the test procedure that was performed;

- A water/sediment sample was prepared and placed in the 55-gallon drum for testing. Various calculations were utilized to determine the required water/sediment ratio. The volume of the sample was forty (40) gallons. Once the materials were placed into the drum the sample was mixed with an industrial mixer. As the material was being mixed the bottom of the drum was sounded with a metal rod to verify that all of the material was in solution. Two samples were collected during the mixing and percent solids were performed. The test results indicated the solid concentrations were 132.6 and 132.5 g/L which fell within the required range of 130-150 g/L. The test results are attached.
- The polymer was mixed in a five-gallon bucket prior to mixing with the water/sediment sample in the drum. The polymer was added to the drum in the appropriate ratio and allowed to mix with the water/sediment sample.
- The drum was suspended by forklift above the Hanging Bag as the mixing continued. At the appropriate time the 2" diameter valve was opened on the bottom of the drum and the material was allowed to flow into the bag.
- As the material flowed into the bag the water began to seep from the sides into the container below. The water was collected at predetermined time intervals and the total solids were determined as indicated in the table below. The test results are attached.

Time	Total Solids
1 Minute	3.9
10 Minutes	0.6
60 Minutes	0.6
24 Hours	0.6

- The bag was allowed to drain into the container for the time duration of 35 days. A small access window was cut into the bag after 4 days and a 1.5 inch diameter brass cylinder was pushed vertically into the top of the sample near the center portion of the soil. The brass cylinder was removed and a moisture content and density was performed. Moisture contents and density tests were also performed at 7, 14, 21, 28 and 35 days. In general the initial moisture content was 70.18 percent dropping to 39.69 percent at the conclusion of the test. The test results are attached.
- The initial water/sediment volume was 40 gallons. Over the duration of the hanging bag test a total of 35.46 gallons of water were returned to the bottom container. The return water was collected and weighed for a period of 5 days, after which, the flow from the bag was too small to measure.

- The entire sample was removed from the bag after 35 days. The bag was cut along the sides which allowed us to view the settled layers of the soil. As expected, the coarser materials had settled at the bottom of the bag. An additional observation was that the soil adjacent the sides of the bag were very dry.
- After the soil was removed from the bag, the entire sample was mixed in a pan which included the center portion along with the dry side material. The center moisture content at the end of the 35 days was 39.69 percent. The moisture content of the mixed center and side materials was 10.6 percent. As a note, the mixed moisture content was approximately 6 percent dry of the optimum moisture content indicated by the Standard Proctor. This observation indicates that if the material were to be mixed during the production operation, the composite moisture content may be considerably less than the value obtained from testing the center of the soil mass.
- A one point proctor with a standard effort was performed on the mixed sample and the results indicated a moisture content of 12.6 percent and a dry density of 94.9 pcf. The results are attached.

Geotechnical Testing

The geotechnical testing program consisted of a sieve analysis, Atterberg Limit, specific gravity, Standard Proctor, a 1-point proctor and a consolidated undrained triaxial test with pore pressure readings. The sieve analysis results indicated that 100 percent passed the ¾ inch sieve and 35.8 percent passed the #200 sieve. The Atterberg Limit results showed that the material was non-plastic. The specific gravity of the material was 2.69. The Standard Proctor indicated an optimum moisture content of 17.9 percent and a maximum dry density of 105.8 pcf. A one point proctor at the standard effort was performed on the bag sample at the time of removal. The moisture content was 12.6 percent and the dry density was 94.9 pcf. A consolidated undrained Triaxial test with pore pressure readings series was performed and the results are attached for you review and interpretation. The triaxial samples were remolded near the optimum moisture content and at a compaction effort of approximately 90 percent of the Standard Proctor. All of the above referenced test results are attached.

The following table summarizes the test results and the data sheets are attached.

Test	Result
Sieve Analysis	
% passing ¾ inches	100.0
% passing #10 sieve	97.74
% passing #200 sieve	35.8
Classification	Brown Silty Sand
USCS Classification	SM
Atterberg Limit	Non Plastic
One Point Proctor	
Moisture Content	12.6%
Dry Density	94.9 pcf
Standard Proctor	
Optimum Moisture	17.9%
Maximum Density	105.8 pcf
Specific Gravity	2.69
Consolidated Undrained Triaxial	
Phi Angle	27.76

Summary

Geotechnics performed the Hanging Bag test in general accordance with the Miratech video that was reviewed prior to the testing. Two polymer sources were utilized to identify the best suited additive that would allow the soil to settle in the bag and the water to flow through the bag with minimal solids. A

water/sediment sample was prepared and placed into a drum for mixing with the polymer. The drum was then raised above the hanging bag and the sample was discharged into the bag. The bag was allowed to drain over a period of 35 days with samples being collected on a weekly basis for moisture contents and density. At the end of the 35 days the sample was removed from the bag and various geotechnical tests were performed.

During the test, photographs were taken at various time intervals and are attached. If you require additional information or clarification, please call.

Sincerely Yours,
Geotechnics, Inc.

Randy O'Rourke
President



Hanging Bag Test Data

Hanging Bag Test
North Park Lake Project
U. S. Army Corps of Engineers, Pittsburgh District
Pittsburgh, Pennsylvania

TOTAL SOLIDS

ASTM D2216 (Modified)

SOP S1

Client **Gannett Fleming**
Client Reference **USACE / North Park Lake**
Project No. **2003-093-01**

Lab ID		01	02	03	04
Boring No.		NA	NA	NA	NA
Depth (ft)		NA	NA	NA	NA
Sample No.		1 min.	10 min.	60 min.	24 hrs
Volume of Liquid (l)	(For g/l only)	0.5	0.5	0.5	0.5
Tare Number		639	684	1003	2331
Wt. of Tare & WS (gm)	(For % only)	NA	NA	NA	NA
Wt. of Tare & DS (gm)		104.09	101.66	98.18	99.81
Wt. of Tare (gm)		102.15	101.34	97.88	99.51
Wt. of Water (gm)		NA	NA	NA	NA
Wt. of DS (gm)		1.94	0.32	0.3	0.3
Total Solids Content (g/l)		3.9	0.6	0.6	0.6
Percent Solids (%)		NA	NA	NA	NA

Notes: Total solids of the hanging bag effluent at the above referenced times.

Tested By **LW** Date **4/29/03** Checked By _____ Date _____

HANGING BAG UNIT WEIGHT

Client	Gannett Fleming, Inc.	Boring No.	Hanging Bag
Client Reference	USACE / North Park Lake	Depth Pushed(ft)	NA
Project No.	2003-093-01	Shelby Tube No.	NA
Lab ID	2003-093-01-03	Recovery(ft)	NA

MOISTURE CONTENT

Section Number	4 Day	7 Day	14 Day	21 Day	28 Day	35 Day
Tare Number	673	586	542	285	627	2318
Wt. Tare & WS(gm.)	273.01	319.85	275.98	237.80	301.19	161.68
Wt. Tare & DS(gm.)	190.49	228.94	209.00	168.06	240.91	117.99
Wt. Tare(gm.)	72.90	82.44	82.43	8.07	86.59	7.90
Moisture Content(%)	70.18	62.05	52.92	43.59	39.06	39.69

UNIT WEIGHT

Wt. Tube & WS.(gms.)	310.43	344.95	344.00	342.33	327.76	263.07
Wt. Of Tube(gms.)	106.62	106.62	106.78	106.78	106.60	106.60
Wt. Of WS.(gms.)	203.81	238.33	237.22	235.55	221.16	156.47
Length 1 (in.)	5.934	5.934	6.010	5.934	5.934	3.035
Length 2 (in.)	5.936	5.936	6.012	5.936	5.929	3.489
Length 3 (in.)	5.937	5.937	6.010	5.937	5.932	3.707
Top Diameter (in.)	1.457	1.457	1.452	1.457	1.457	1.457
Middle Diameter (in.)	1.446	1.446	1.443	1.446	1.449	1.449
Bottom Diameter (in.)	1.451	1.451	1.451	1.451	1.449	1.449
Sample Volume (cc)	160.91	160.91	162.35	160.91	160.88	92.50
Moisture Content(%)	70.18	70.18	52.92	43.59	39.06	39.69
Unit Wet Wt.(gms/cc)	1.27	1.48	1.5	1.5	1.4	1.7
Unit Wet Wt.(pcf.)	79.0	92.4	91.18	91.34	85.78	105.56
Unit Dry Wt.(gms/cc)	0.74	0.87	1.0	1.0	1.0	1.2
Unit Dry Wt.(pcf.)	46.4	54.3	59.6	63.6	61.7	75.6

Water Released from bag

Total Weight of Water	142852 gms		
Weight of Containers	10248 gms		
Weight of Water	132604 gms		
 Volume of water	 132604 cm ³	 35.46 gal	

Tested By	DB	Date	4/24/03	Checked By	Date
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MOISTURE CONTENT

ASTM D 2216 (SOP-S1)

Client **GANNET FLEMING**
Client Reference **USACE/N.PARK LAKE**
Project No. **2003-093-01**

Lab ID **03-200**
Boring No. **NA**
Depth (ft) **NA**
Sample No. **SOLIDS**

Tare Number **564**
Wt. of Tare & WS (gm) **681.2**
Wt. of Tare & DS (gm) **623.8**
Wt. of Tare (gm) **82.47**
Wt. of Water (gm) **57.4**
Wt. of DS (gm) **541.33**

Water Content (%) 10.6

Notes : *Final moisture content of the mixed bag sample at the end of 35 days.*

Tested By	RO	Date	6/10/03	Checked By		Date	
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page 1 of 1

DCN: CT-S1 DATE 6-30-98 REVISION: 2

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ONE POINT PROCTOR

Client	Gannett Fleming ,INC	Boring No.	NA
Client Reference	USACE/NORTH PARK LAKE	Depth (ft)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03	Test Type	STANDARD
Visual Description	BROWN SANDY CLAY AND ROCK FRAGMENTS		

MOLD

Mold ID No.	G	1031
Weight of Mold (gm)		4298
Volume of Mold(cc)		943

SPECIMEN

Wt. of Mold & WS (gm)	5913
Wt. of Mold (gm)	4298
Wt. of WS	1615
Mold Volume (cc)	943

MOISTURE/DENSITY

Tare Number	1734
Wt. of Tare & WS (gm)	413.50
Wt. of Tare & DS (gm)	376.45
Wt. of Tare (gm)	83.06
Wt. of Water (gm)	37.05
Wt. of DS (gm)	293.39
Wet Density (gm/cc)	1.71
Wet Density (pcf)	106.9
Moisture Content (%)	12.6
Dry Density (pcf)	94.9

Notes: This test was performed on the mixed bag sample at the end of 35 days.

Tested By	DDA	Date	6/6/07	Checked By	Date
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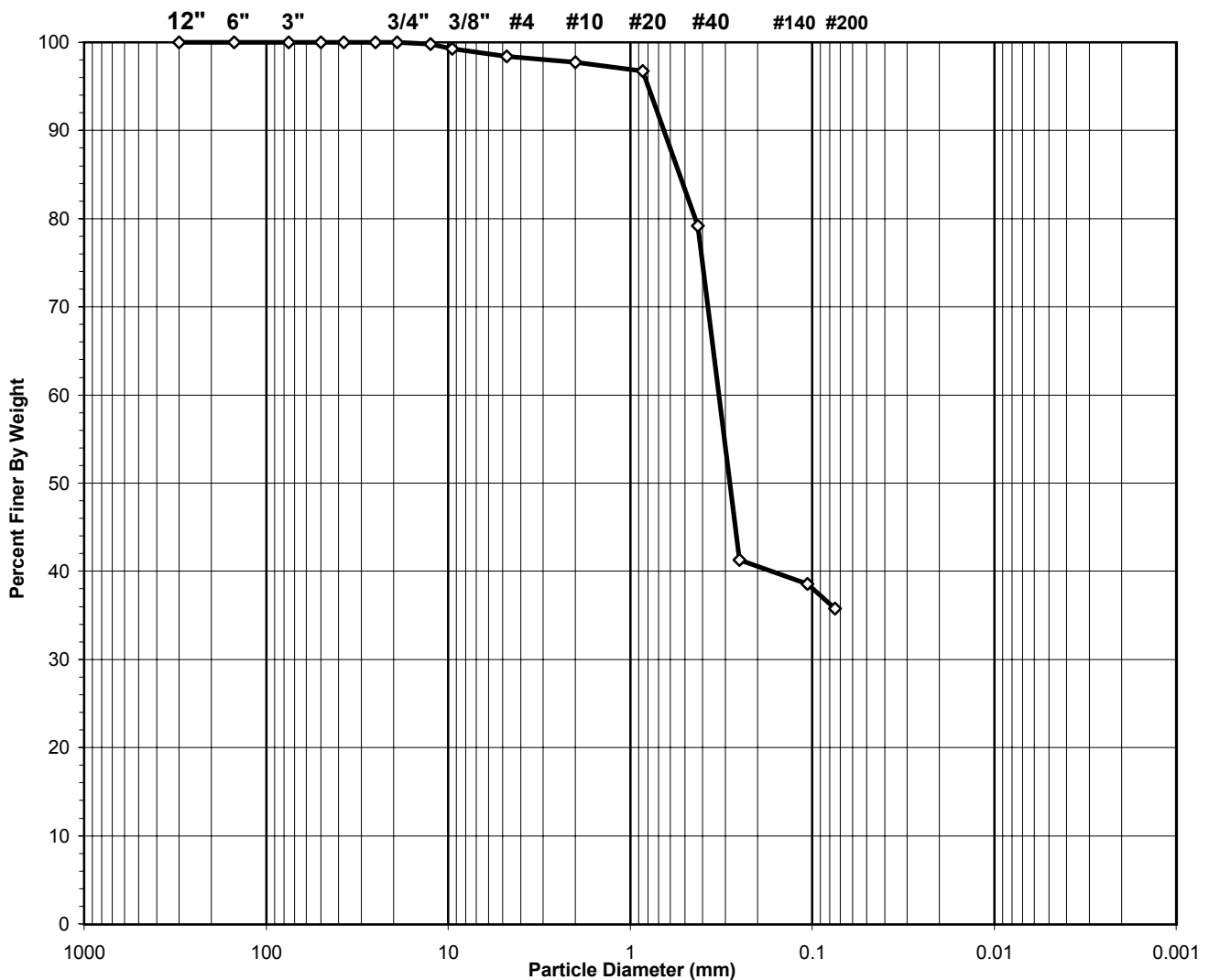
Geotechnical Test Data

Hanging Bag Test
North Park Lake Project
U. S. Army Corps of Engineers, Pittsburgh District
Pittsburgh, Pennsylvania

SIEVE ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

Client	GARRET FLEMING	Boring No.	NA
Client Reference	USACE / N.PARK LAKE	Depth (ft)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03	Soil Color	BROWN

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol sm, ASSUMED

USCS Classification SILTY SAND (NON PLASTIC FINES)

WASH SIEVE ANALYSIS

ASTM D 422-63/AASHTO T88-00 (SOP-S3)

Client **GARRET FLEMING**
 Client Reference **USACE / N.PARK LAKE**
 Project No. **2003-093-01**
 Lab ID **2003-093-01-03**

Boring No. **NA**
 Depth (ft) **NA**
 Sample No. **SOLIDS**
 Soil Color **BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2354	Tare No.	NA
Wgt. Tare + Wet Specimen (gm)	1209.90	Wgt. Tare + Wet Specimen (gm)	NA
Wgt. Tare + Dry Specimen (gm)	1099.30	Wgt. Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	97.87	Weight of Tare (gm)	NA
Weight of Water (gm)	110.60	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	1001.43	Weight of Dry Soil (gm)	NA
Moisture Content (%)	11.0	Moisture Content (%)	NA

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	1001.43
Dry Weight - 3/4" Sample (gm)	642.9	Weight of minus #200 material (gm)	358.53
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	642.90
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt. of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	100.00
6"	150	0.00	0.00	0.00	100.00	100.00
3"	75	0.00	0.00	0.00	100.00	100.00
2"	50	0.00	0.00	0.00	100.00	100.00
1 1/2"	37.5	0.00	0.00	0.00	100.00	100.00
1"	25.0	0.00	0.00	0.00	100.00	100.00
3/4"	19.0	0.00	0.00	0.00	100.00	100.00
1/2"	12.50	2.02	0.20	0.20	99.80	99.80
3/8"	9.50	5.12	0.51	0.71	99.29	99.29
#4	4.75	8.52	0.85	1.56	98.44	98.44
#10	2.00	6.97	0.70	2.26	97.74	97.74
#20	0.850	9.91	0.99	3.25	96.75	96.75
#40	0.425	175.73	17.55	20.80	79.20	79.20
#60	0.250	379.50	37.90	58.69	41.31	41.31
#140	0.106	27.61	2.76	61.45	38.55	38.55
#200	0.075	27.52	2.75	64.20	35.80	35.80
Pan	-	358.53	35.80	100.00	-	-

Tested By **SC** Date **6/10/03** Checked By _____ Date _____

ATTERBERG LIMIT
ASTM D 4318-00 (SOP - S4)

Client	GANNETT FLEMING	Boring No.	NA
Client Reference	USACE/N.PARK LAKE	Depth (ft)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03	Visual Description	BROWN SILT (Minus No. 40 sieve material, Airdried)

**NON - PLASTIC
MATERIAL**

SPECIFIC GRAVITY

ASTM D 854-98 (SOP - S5)

Client	GANNETT FLEMING	Boring No.	NA
Client Reference	USACE / N. PARK LAKE	Depth (ft)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03	Visual Description	BROWN SEDIMENT (Minus No.4 sieve material, airdried)

Replicate Number	1	2
Pycnometer ID	G 922	G 1003
Weight of Pycnometer + Soil + Water (gm)	740.3	726.4
Temperature, T (°Celsius)	27.8	28.6
Weight of Pycnometer + Water (gm)	684.66	669.00
Tare Number	2489	2337
Weight of Tare + Dry Soil (gm)	177.2	190.71
Weight of Tare (gm)	88.72	98.99
Weight of Dry Soil (gm)	88.48	91.72
Specific Gravity of Soil @ T	2.694	2.672
Specific Gravity of Water @ T	0.9963	0.9961
Conversion Factor for Temperature T	0.9981	0.9979
Specific Gravity @ 20° Celsius	2.699	2.678

Average Specific Gravity @ 20° Celsius

2.69

Tested By DB Date 6/10/03 Checked By Date

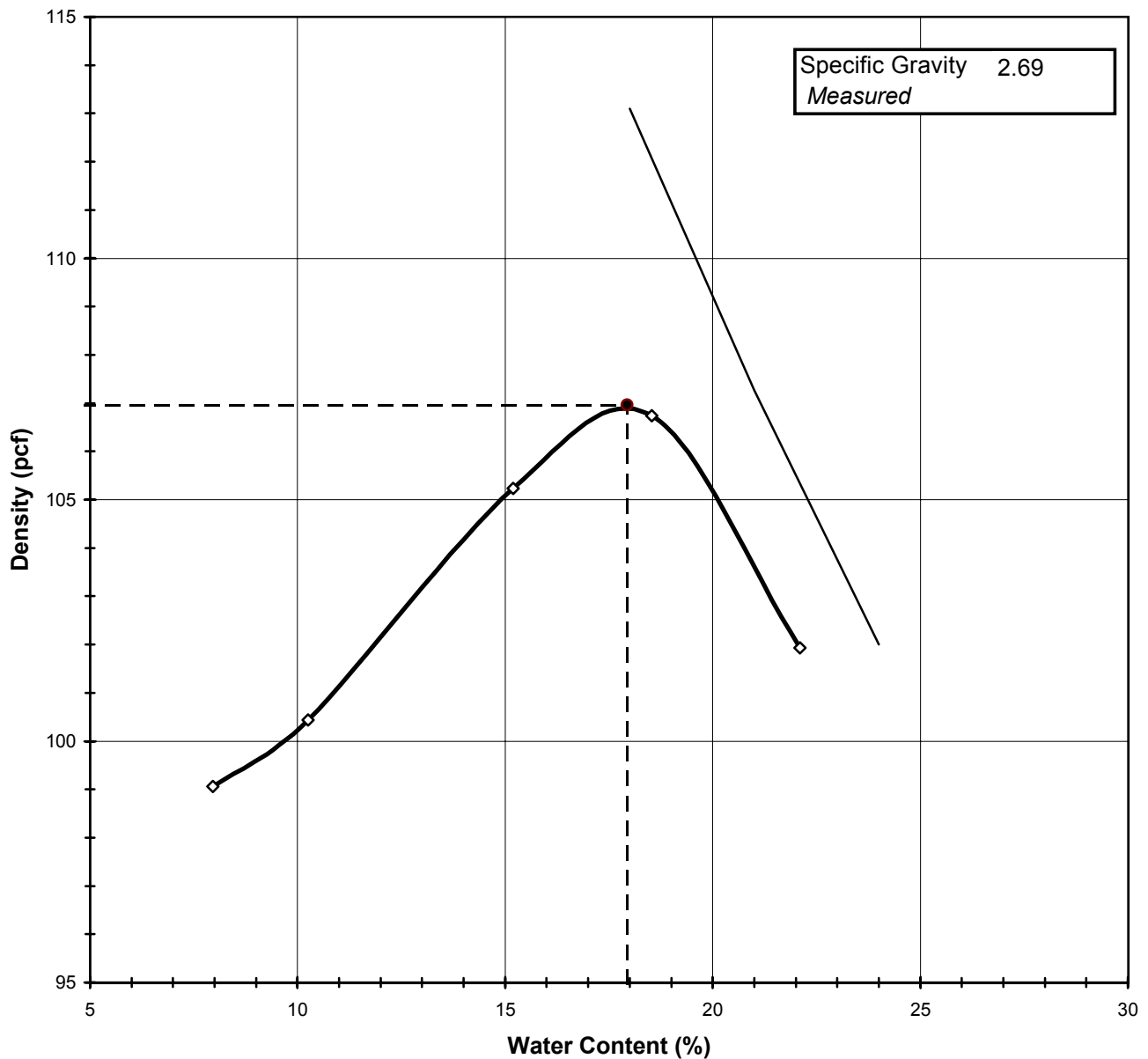
MOISTURE DENSITY RELATIONSHIP

ASTM D698-91 SOP-S12

Client	GANNETT FLEMING	Boring No.	NA
Client Reference	USACE / N. PARK LAKE	Depth (ft)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03	Test Method	STANDARD
Visual Description	BROWN SEDIMENT		

Optimum Water Content
Maximum Dry Density

18.0
107.0



Tested By **RO** Date **6/10/03** Checked By Date

MOISTURE - DENSITY RELATIONSHIP

ASTM D698-91 SOP-S12

Client **GANNETT FLEMING**
Client Reference **USACE / N. PARK LAKE**
Project No. **2003-093-01**
Lab ID **2003-093-01-03**

Boring No. **NA**
Depth (ft) **NA**
Sample No. **SOLIDS**

Visual Description **BROWN SEDIMENT**

Total Weight of the Sample (gm)	NA
As Received Water Content(%)	NA
Measured Specific Gravity	2.69
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	B

TestType	STANDARD
Rammer Weight (lbs)	5.5
Rammer Drop (in)	12
Rammer Type	Mechanical
Machine ID	G 774
Mold ID	G 606
Mold diameter	4"
Weight of the Mold	4200
Volume of the Mold(cc)	940

Mold / Specimen

Point No.	1	2	3	4	5
Wt. of Mold & WS (gm)	5811	5868	6026	6106	6075
Wt. of Mold (gm)	4200	4200	4200	4200	4200
Wt. of WS	1611	1668	1826	1906	1875
Mold Volume (cc)	940	940	940	940	940

Moisture Content / Density

Tare Number	1723	573	590	1696	607
Wt. of Tare & WS (gm)	419.10	457.90	446.10	434.80	438.40
Wt. of Tare & DS (gm)	394.35	423.00	398.10	379.84	374.05
Wt. of Tare (gm)	83.51	82.42	82.06	83.27	82.96
Wt. of Water (gm)	24.75	34.90	48.00	54.96	64.35
Wt. of DS (gm)	310.84	340.58	316.04	296.57	291.09

Wet Density (gm/cc)	1.71	1.77	1.94	2.03	1.99
Wet Density (pcf)	106.9	110.7	121.2	126.5	124.5
Moisture Content (%)	8.0	10.2	15.2	18.5	22.1
Dry Density (pcf)	99.1	100.4	105.2	106.7	101.9

Zero Air Voids

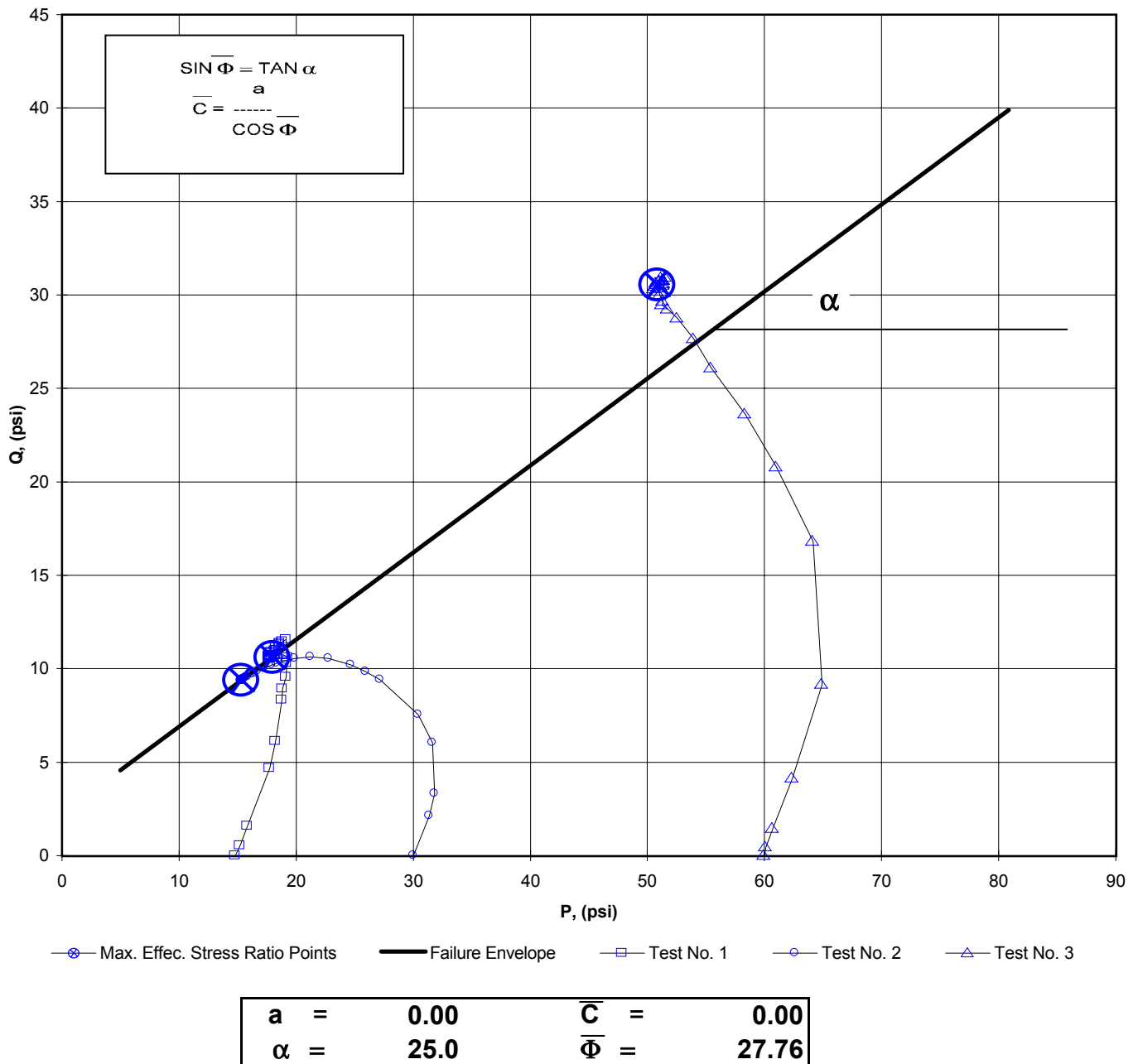
Moisture Content (%)	18.0	21.0	24.0
Dry Unit Weight (pcf)	113.1	107.3	102.0

Tested By **RO** Date **6/10/03** Checked By _____ Date _____

**CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS**
ASTM D4767-95 / AASHTO T297-94 (SOP-S28)

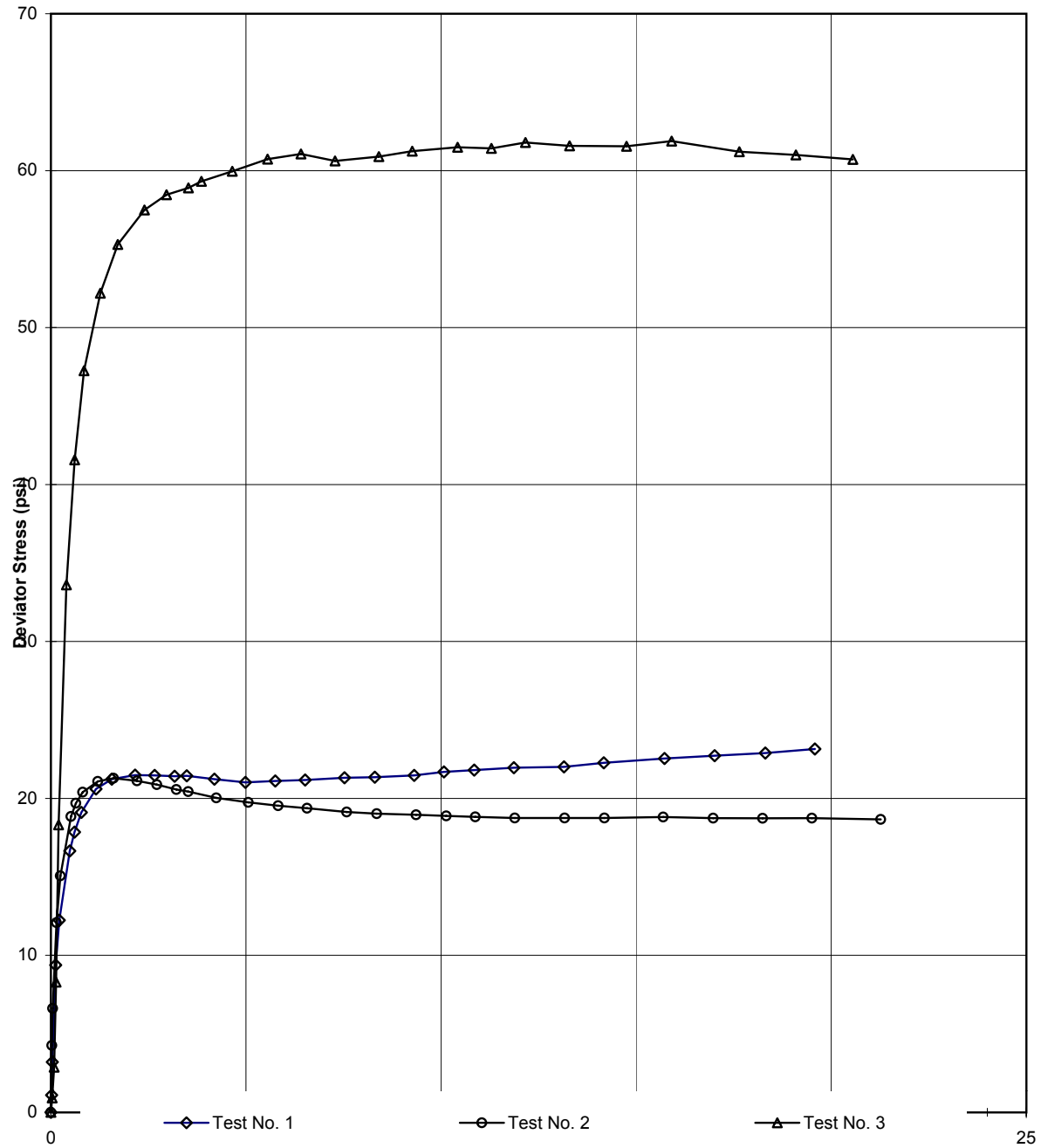
Client	GANNETT FLEMING	Boring No.	NA
Client Reference	USACE/N. PARK LAKE	Depth(ft.)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03		

Consolidated Undrained Triaxial Test with Pore Pressure



**CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS**
ASTM D4767-95 / AASHTO T297-94 (SOP-S28)

Client	GANNETT FLEMING	Boring No.	NA
Client Reference	USACE/N. PARK LAKE	Depth(ft.)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03		
Visual Description:	BROWN SAND (REMOLDED)		



Tested By	DB	Date	6/25/03	Approved By	Date
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**CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS**

ASTM D4767-95 / AASHTO T297-94 (SOP-S28)

Client	GANNETT FLEMING	Boring No.	NA
Client Reference	USACE/N. PARK LAKE	Depth(ft.)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03		

Visual Description: **BROWN SAND (REMOLDED)**

Stage No.	1
Test No	1

PRESSURES (psi)

Cell Pressure(psi)	65
Back Pressure(psi)	50.2
Eff. Cons. Pressure(psi)	14.8
Pore Pressure	
Response (%)	99

MAXIMUM OBLIQUITY POINTS

\bar{P}	=	17.96
Q	=	10.61

INITIAL SAMPLE DIMENSIONS (in)

Length 1	6.014	Diameter 1	2.869
Length 2	6.014	Diameter 2	2.869
Length 3	6.014	Diameter 3	2.869
Avg Leng.=	6.014	Avg. Diam.=	2.869

VOLUME CHANGE

Initial Burette Reading (ml)	24.8
Final Burette Reading (ml)	20.2
Final Change (ml)	4.7

Initial Dial Reading (D.R.), mils	506
D.R. After Saturation, mils	537
D.R. After Consolidation, mils	552

LOAD (LBS)	DEFORMATION (INCHES)	PORE PRESSURE (PSI)
15.8	0.000	50.2
22.8	0.001	50.3
36.2	0.002	50.7
75.6	0.007	52.0
93.9	0.013	52.9
122.3	0.029	54.6
130.1	0.036	55.1
138.4	0.046	55.4
148.5	0.069	56.1
153.1	0.093	56.3
155.6	0.129	56.9
156.2	0.159	57.4
156.6	0.189	57.4
157.2	0.208	57.5
156.9	0.250	57.6
156.6	0.298	57.7
158.4	0.343	57.8
160.0	0.389	57.9
162.6	0.449	58.0
164.1	0.495	57.9
166.5	0.556	58.0
169.4	0.601	58.0
171.5	0.648	58.0
174.4	0.708	57.8
177.1	0.785	57.7
181.0	0.846	57.9
186.1	0.939	57.7
190.1	1.015	57.7
194.2	1.093	57.6
199.1	1.169	57.4

Tested By	DB	Date	6/17/03	Input Checked By		Date	
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**CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS**
ASTM D4767-95 / AASHTO T297-94 (SOP-S28)

Client	GANNETT FLEMING	Boring No.	NA
Client Reference	USACE/N. PARK LAKE	Depth(ft.)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03		

Visual Description: BROWN SAND (REMOLDED)

Effective Confining Pressure (psi)	14.8	Stage No.	1
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in.)	6.01
Initial Sample Diameter (in.)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.88

VOLUME CHANGE

Volume After Consolidation (in^3)	37.99
Length After Consolidation (in)	5.97
Area After Consolidation (in^2)	6.366

Strain (%)	Deviation Stress	Δ U	σ ₁	σ ₃	Effective Principle Stress Ratio	A	P	Q
0.02	1.09	0.12	15.78	14.7	1.075	0.11	15.23	0.55
0.03	3.20	0.54	17.46	14.3	1.225	0.17	15.86	1.60
0.12	9.39	1.76	22.43	13.0	1.719	0.19	17.74	4.69
0.21	12.24	2.67	24.37	12.1	2.009	0.22	18.25	6.12
0.48	16.65	4.36	27.09	10.4	2.595	0.26	18.77	8.33
0.61	17.85	4.89	27.76	9.9	2.801	0.28	18.84	8.93
0.78	19.11	5.20	28.72	9.6	2.990	0.27	19.16	9.56
1.16	20.60	5.89	29.51	8.9	3.313	0.29	19.21	10.30
1.56	21.23	6.14	29.89	8.7	3.451	0.29	19.27	10.61
2.16	21.49	6.65	29.64	8.1	3.637	0.31	18.89	10.74
2.66	21.47	7.15	29.11	7.6	3.807	0.34	18.38	10.73
3.17	21.41	7.24	28.97	7.6	3.833	0.34	18.27	10.71
3.48	21.44	7.30	28.94	7.5	3.859	0.34	18.22	10.72
4.19	21.23	7.45	28.58	7.4	3.888	0.35	17.96	10.61
4.99	21.02	7.46	28.36	7.3	3.862	0.36	17.85	10.51
5.75	21.11	7.62	28.29	7.2	3.939	0.36	17.74	10.56
6.52	21.17	7.71	28.26	7.1	3.987	0.37	17.67	10.59
7.53	21.32	7.82	28.30	7.0	4.055	0.37	17.64	10.66
8.30	21.35	7.68	28.47	7.1	3.999	0.36	17.80	10.68
9.31	21.46	7.81	28.45	7.0	4.072	0.37	17.72	10.73
10.07	21.69	7.84	28.65	7.0	4.117	0.37	17.80	10.85
10.85	21.80	7.84	28.76	7.0	4.132	0.36	17.86	10.90
11.87	21.96	7.59	29.17	7.2	4.046	0.35	18.19	10.98
13.15	22.01	7.46	29.34	7.3	4.000	0.34	18.34	11.00
14.17	22.27	7.65	29.41	7.1	4.115	0.35	18.28	11.13
15.73	22.55	7.46	29.88	7.3	4.073	0.33	18.61	11.27
17.01	22.72	7.53	29.99	7.3	4.126	0.33	18.63	11.36
18.31	22.89	7.40	30.30	7.4	4.092	0.33	18.85	11.45
19.58	23.15	7.21	30.74	7.6	4.051	0.31	19.16	11.57

**CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS**

ASTM D4767-95 / AASHTO T297-94 (SOP-S28)

Client	GANNETT FLEMING	Boring No.	NA
Client Reference	USACE/N. PARK LAKE	Depth(ft.)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03		

Visual Description: BROWN SAND (REMOLDED)

Stage No.	1
Test No	2

INITIAL SAMPLE DIMENSIONS (in)

Length 1	6.014	Diameter 1	2.869
Length 2	6.014	Diameter 2	2.869
Length 3	6.014	Diameter 3	2.869
Avg Leng.=	6.014	Avg. Diam.=	2.869

PRESSURES (psi)

Cell Pressure(psi)	90.5
Back Pressure(psi)	60.5
Eff. Cons. Pressure(ps	30.0
Pore Pressure	
Response (%)	100

VOLUME CHANGE

Initial Burette Reading (ml)	96.0
Final Burette Reading (ml)	63.2
Final Change (ml)	32.8

MAXIMUM OBLIQUITY POINTS

P	=	15.31
Q	=	9.38

Initial Dial Reading (D.R.), mils	49
D.R. After Saturation, mils	70
D.R. After Consolidation, mils	131

LOAD (LBS)	DEFORMATION (INCHES)	PORE PRESSURE (PSI)
13.4	0.000	60.5
39.6	0.001	61.3
54.1	0.003	62.0
87.8	0.009	64.9
106.3	0.014	67.6
129.9	0.031	72.8
135.3	0.038	74.4
139.9	0.048	76.0
144.6	0.071	78.3
146.4	0.095	79.9
146.2	0.131	81.2
145.4	0.161	81.8
144.1	0.191	82.5
143.6	0.209	82.8
142.1	0.252	83.3
141.3	0.300	83.7
140.9	0.346	83.8
140.9	0.390	84.0
140.7	0.450	84.2
141.1	0.495	84.3
142.0	0.555	84.4
142.6	0.601	84.5
143.3	0.645	84.5
144.2	0.705	84.5
146.2	0.781	84.6
147.8	0.842	84.5
150.6	0.931	84.5
152.2	1.007	84.5
154.3	1.082	84.6
156.6	1.157	84.4
159.1	1.262	84.5

Tested By	DB	Date	7/1/03	Input Checked By	Date
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**CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS**
ASTM D4767-95 / AASHTO T297-94 (SOP-S28)

Client	GANNETT FLEMING	Boring No.	NA
Client Reference	USACE/N. PARK LAKE	Depth(ft.)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03		

Visual Description: BROWN SAND (REMOLDED)

Effective Confining Pressure (psi)	30.0	Stage No.	1
		Test No	2

INITIAL DIMENSIONS

Initial Sample Length (in.)	6.01
Initial Sample Diameter (in.)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.88

VOLUME CHANGE

Volume After Consolidation (in^3)	36.47
Length After Consolidation (in)	5.93
Area After Consolidation (in^2)	6.148

Strain (%)	Deviation Stress	ΔU	$\bar{\sigma}_1$	$\bar{\sigma}_3$	Effective Principle Stress Ratio	\bar{A}	\bar{P}	Q
0.02	4.26	0.78	33.48	29.2	1.146	0.18	31.35	2.13
0.05	6.62	1.47	35.15	28.5	1.232	0.22	31.84	3.31
0.14	12.09	4.40	37.68	25.6	1.472	0.36	31.64	6.04
0.24	15.07	7.11	37.97	22.9	1.658	0.47	30.43	7.54
0.52	18.85	12.28	36.57	17.7	2.064	0.65	27.14	9.43
0.64	19.69	13.90	35.79	16.1	2.223	0.71	25.95	9.85
0.82	20.40	15.51	34.89	14.5	2.408	0.76	24.69	10.20
1.20	21.08	17.79	33.30	12.2	2.726	0.84	22.76	10.54
1.61	21.29	19.39	31.89	10.6	3.007	0.91	21.25	10.64
2.21	21.12	20.67	30.45	9.3	3.262	0.98	19.89	10.56
2.71	20.88	21.34	29.54	8.7	3.412	1.02	19.10	10.44
3.22	20.57	21.97	28.60	8.0	3.561	1.07	18.32	10.29
3.52	20.44	22.27	28.17	7.7	3.646	1.09	17.95	10.22
4.24	20.04	22.78	27.26	7.2	3.774	1.14	17.24	10.02
5.06	19.75	23.18	26.57	6.8	3.895	1.17	16.70	9.87
5.83	19.53	23.32	26.22	6.7	3.923	1.19	16.45	9.77
6.57	19.37	23.50	25.88	6.5	3.979	1.21	16.19	9.69
7.58	19.14	23.72	25.42	6.3	4.046	1.24	15.85	9.57
8.35	19.03	23.82	25.21	6.2	4.078	1.25	15.70	9.51
9.36	18.95	23.90	25.05	6.1	4.109	1.26	15.57	9.48
10.13	18.88	23.95	24.93	6.0	4.123	1.27	15.49	9.44
10.88	18.83	23.99	24.84	6.0	4.131	1.27	15.43	9.41
11.89	18.75	24.04	24.71	6.0	4.146	1.28	15.33	9.37
13.17	18.75	24.07	24.69	5.9	4.161	1.28	15.31	9.38
14.19	18.75	24.04	24.71	6.0	4.148	1.28	15.33	9.38
15.69	18.82	24.04	24.78	6.0	4.157	1.28	15.37	9.41
16.98	18.75	23.99	24.75	6.0	4.121	1.28	15.38	9.37
18.24	18.73	24.10	24.63	5.9	4.176	1.29	15.27	9.37
19.51	18.74	23.90	24.84	6.1	4.074	1.28	15.47	9.37
21.27	18.66	23.96	24.70	6.0	4.090	1.28	15.37	9.33

Tested By	DB	Date	7/1/03	Input Checked By		Date	
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**CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS**

ASTM D4767-95 / AASHTO T297-94 (SOP-S28)

Client	GANNETT FLEMING	Boring No.	NA
Client Reference	USACE/N. PARK LAKE	Depth(ft.)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03		

Visual Description: BROWN SAND (REMOLDED)

Stage No.	1
Test No	3

PRESSURES (psi)

Cell Pressure(psi)	105.2
Back Pressure(psi)	45.2
Eff. Cons. Pressure(ps	60.0
Pore Pressure	
Response (%)	96

MAXIMUM OBLIQUITY POINTS

P	=	50.86
Q	=	30.53

INITIAL SAMPLE DIMENSIONS (in)

Length 1	6.014	Diameter 1	2.869
Length 2	6.014	Diameter 2	2.869
Length 3	6.014	Diameter 3	2.869
Avg Leng.=	6.014	Avg. Diam.=	2.869

VOLUME CHANGE

Initial Burette Reading (ml)	48.0
Final Burette Reading (ml)	23.3
Final Change (ml)	24.7

Initial Dial Reading (D.R.), mils	81
D.R. After Saturation, mils	104
D.R. After Consolidation, mils	177

LOAD (LBS)	DEFORMATION (INCHES)	PORE PRESSURE (PSI)
18.5	0.000	45.2
24.2	0.002	45.5
36.4	0.005	45.9
70.3	0.008	47.0
133.0	0.012	49.4
229.1	0.023	57.9
279.5	0.036	65.0
315.9	0.050	70.5
348.3	0.075	75.8
369.5	0.101	78.9
386.1	0.142	81.4
394.4	0.175	82.7
399.4	0.209	83.4
403.5	0.228	83.5
410.9	0.275	84.1
419.7	0.329	84.6
425.6	0.379	84.9
426.5	0.431	84.9
433.3	0.497	85.0
439.6	0.548	85.1
446.8	0.617	84.9
450.5	0.668	84.9
457.4	0.720	84.9
461.6	0.787	84.6
469.0	0.873	84.5
477.7	0.942	84.6
482.2	1.044	84.4
489.0	1.130	84.3
495.3	1.216	84.3

Tested By **DB** Date **6/25/03** Input Checked By _____ Date _____

CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
 ASTM D4767-95 / AASHTO T297-94 (SOP-S28)

Client	GANNETT FLEMING	Boring No.	NA
Client Reference	USACE/N. PARK LAKE	Depth(ft.)	NA
Project No.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03		

Visual Description: BROWN SAND (REMOLDED)

Effective Confining Pressure (psi)	60.0	Stage No.	1
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in.)	6.01
Initial Sample Diameter (in.)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.88

VOLUME CHANGE

Volume After Consolidation (in^3)	36.93
Length After Consolidation (in)	5.92
Area After Consolidation (in^2)	6.240

Strain (%)	Deviation Stress	Δ U	σ ₁	σ ₃	Effective Principle Stress Ratio	A	P	Q
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0.03	0.92	0.34	60.58	59.7	1.015	0.38	60.12	0.46
0.08	2.87	0.74	62.13	59.3	1.048	0.27	60.69	1.44
0.13	8.30	1.78	66.52	58.2	1.143	0.22	62.37	4.15
0.20	18.32	4.23	74.08	55.8	1.328	0.24	64.93	9.16
0.40	33.61	12.66	80.95	47.3	1.710	0.39	64.15	16.81
0.61	41.57	19.78	81.79	40.2	2.034	0.50	61.00	20.79
0.85	47.25	25.25	82.00	34.7	2.360	0.56	58.37	23.63
1.27	52.19	30.64	81.55	29.4	2.778	0.61	55.45	26.10
1.71	55.30	33.68	81.62	26.3	3.101	0.63	53.97	27.65
2.40	57.50	36.18	81.32	23.8	3.414	0.66	52.57	28.75
2.96	58.47	37.50	80.97	22.5	3.598	0.67	51.74	29.23
3.53	58.90	38.20	80.70	21.8	3.701	0.68	51.25	29.45
3.86	59.32	38.33	80.99	21.7	3.737	0.67	51.33	29.66
4.65	59.96	38.92	81.04	21.1	3.844	0.68	51.06	29.98
5.55	60.73	39.40	81.33	20.6	3.948	0.68	50.97	30.37
6.41	61.06	39.68	81.39	20.3	4.004	0.68	50.86	30.53
7.28	60.62	39.75	80.88	20.3	3.993	0.68	50.57	30.31
8.40	60.90	39.80	81.10	20.2	4.015	0.68	50.65	30.45
9.26	61.24	39.86	81.39	20.1	4.040	0.68	50.76	30.62
10.42	61.49	39.69	81.80	20.3	4.027	0.67	51.06	30.74
11.29	61.42	39.69	81.72	20.3	4.025	0.67	51.01	30.71
12.16	61.79	39.68	82.11	20.3	4.041	0.67	51.22	30.90
13.30	61.58	39.44	82.14	20.6	3.994	0.67	51.35	30.79
14.76	61.55	39.33	82.22	20.7	3.978	0.67	51.44	30.77
15.91	61.88	39.37	82.51	20.6	3.999	0.66	51.57	30.94
17.65	61.20	39.17	82.03	20.8	3.939	0.67	51.43	30.60
19.09	61.00	39.13	81.87	20.9	3.923	0.67	51.37	30.50
20.56	60.71	39.11	81.60	20.9	3.906	0.67	51.25	30.36

**CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS**

ASTM D4767-95 / AASHTO T297-94 (SOP-S28)

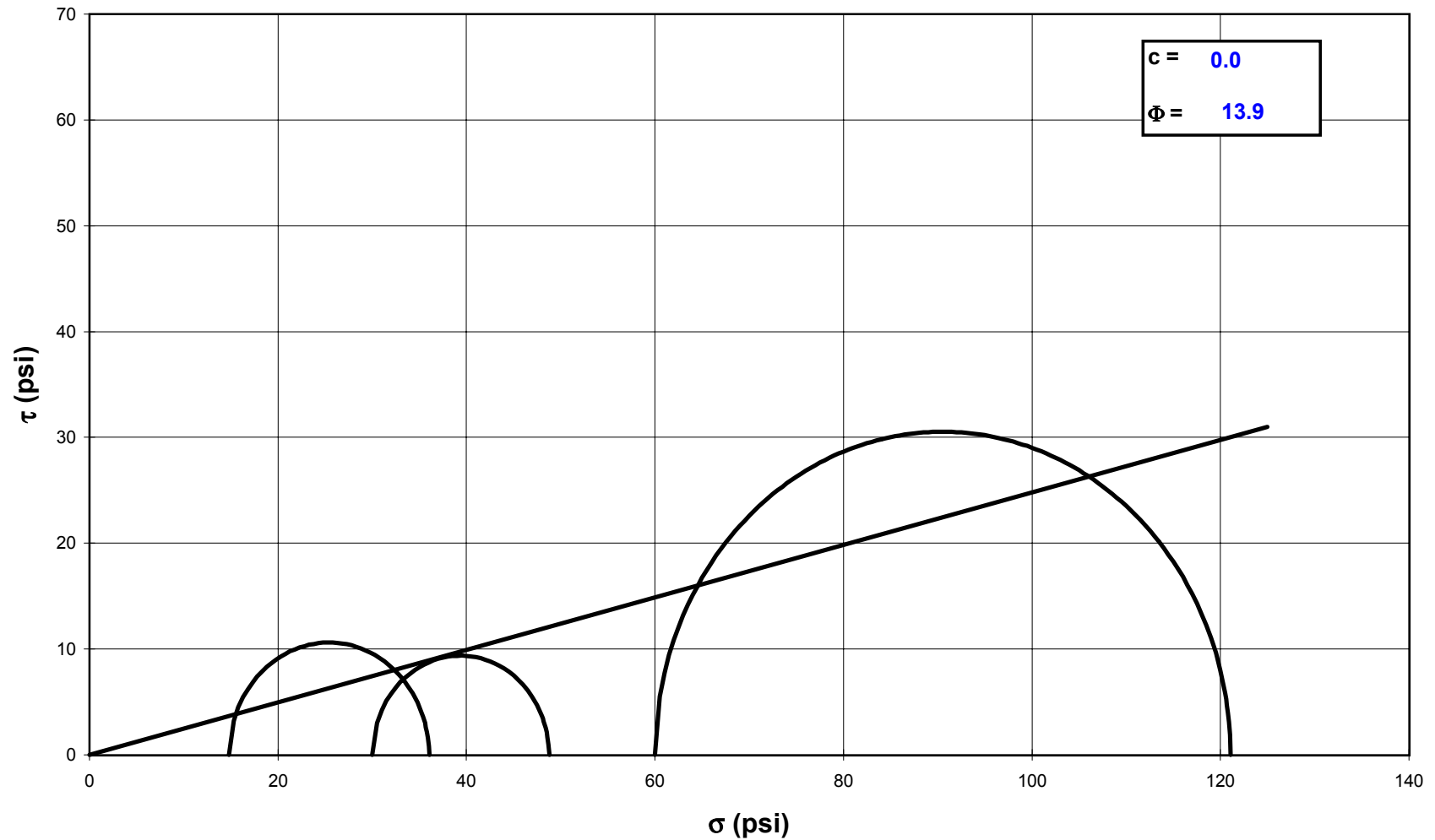
Client **GANNETT FLEMING**
Client Reference **USACE / N. PARK LAKE**
Project No. **2003-093-01**
Lab ID **2003-093-01-03** Specific Gravity (assumed) **2.7**
Visual Description: **BROWN SAND (REMOLDED)**

SAMPLE CONDITION SUMMARY

Boring No.	NA	NA	NA
Depth (ft)	NA	NA	NA
Sample No.	SOLIDS	SOLIDS	SOLIDS
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.002	0.002	0.002
Back Pressure (psi)	50.2	60.5	45.2
Consolidation Time (days)	1	1	1
Initial State (w%)	17.2	16.6	16.8
Total Unit Weight (pcf)	111.0	110.7	110.8
Dry Unit Weight (pcf)	94.8	94.9	94.9
Final State (w%)	26.0	23.6	24.3
Initial State Void Ratio,e	0.778	0.775	0.777

MOHR TOTAL STRENGTH ENVELOPE

Client	GANNETT FLEMING	Boring No.	NA
Client Ref. No.	USACE / N. PARK LAKE	Depth(ft.)	NA
Project no.	2003-093-01	Sample No.	SOLIDS
Lab ID	2003-093-01-03	Visual Description	BROWN SAND (REMOLDED)

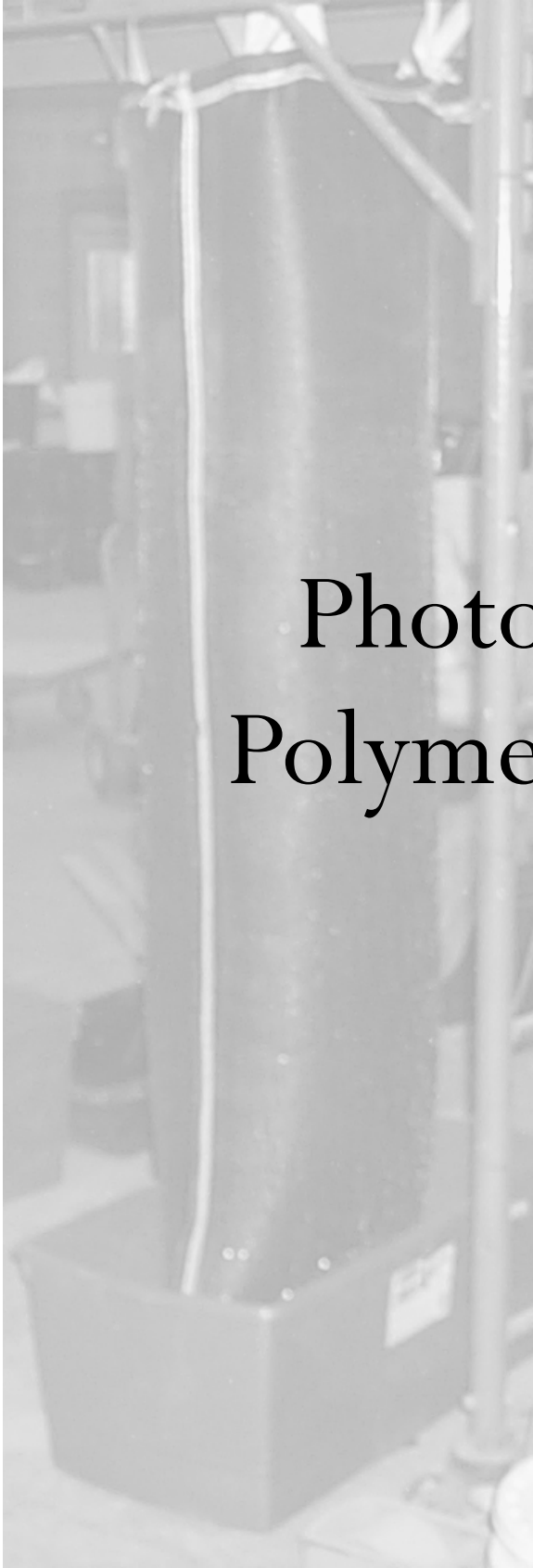


Tested By: DB

Date: 6/17/03 Approved By:

NOTE: GRAPH NOT TO SCALE

Date:



Photographs Polymer Testing

Hanging Bag Test
North Park Lake Project
U. S. Army Corps of Engineers, Pittsburgh District
Pittsburgh, Pennsylvania

Mixing Equipment Used for The Polymer Tests



CAKE FORMATION WITH POLYMER 6950 AT DIFFERENT CONCENTRATIONS



Polymer 6950 @ 120 ppm.

- Well formed cake.
- Good clarity of supernat.
- No fines in supernat sample.
- Water clarity is good.



Polymer 6950 @ 80 ppm

- Not as well formed cake.
- Water clarity ok.

- **Polymer 6950 @ 60 ppm.**
- Poorly formed cake (no picture).
- Substantial solids and fines in supernat.
- Water clarity poor.
- Pin flocking supernat.



Polymer 6950 @ 160 ppm

- Water clarity, excellent.
- Cake formation Ok, but runny and sticking to sample.

Polymers A120, A130 and 6450 Emulsion



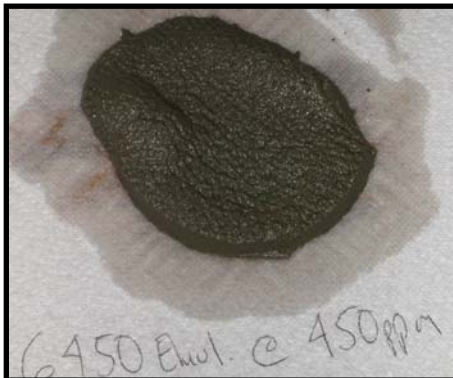
Polymer A120@120 ppm

- Water clarity ok, but fines flowed through at the beginning of test.
- Cake formation was OK.



Polymer A130 @ 120 ppm.

- Well formed cake.
- Good clarity of supernat.
- No fines in supernat sample.
- Water clarity is good.



Polymer #6450@450 ppm

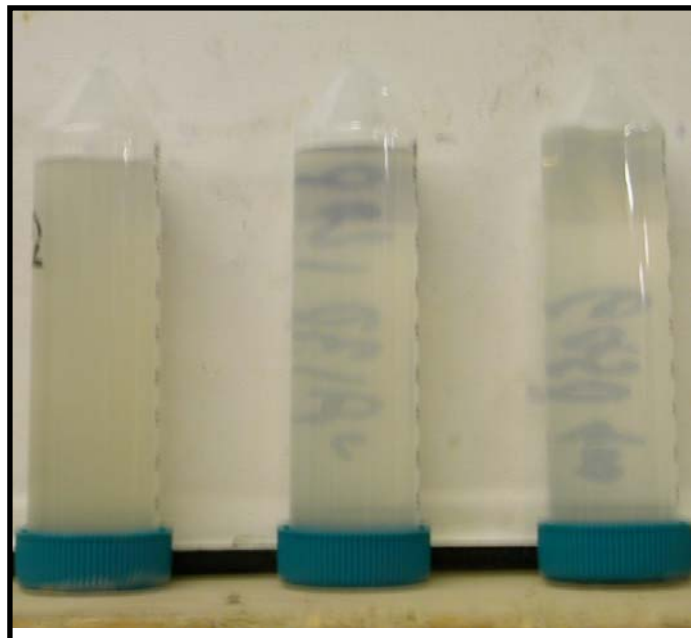
- Water clarity good with very little fines flowing through the beginning of test.
- Cake formation ok.

Turbidity Tests

A120

A130

#6450



Turbidity Samples for #6950
 Blank 60 ppm 80 ppm 120 ppm 160 ppm



Polymer #6550@120 ppm

- water clarity ok, but fines flowed through at the beginning of test.
- No picture of cake.



Polymer #6550@200 ppm

- Water clarity good with very little fines flowing through at the beginning of test.
- Cake formation ok.



Photographs Hanging Bag Test

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Pittsburgh, Pennsylvania

Photographs
Hanging Bag Test
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Pittsburgh District

Making the polymer prior to
mixing with the drum sample.



Sounding the bottom of the drum
prior to adding the polymer

Adding the polymer to the
sediment/water drum sample.



Mixing of the polymer and the
water/sediment drum sample.

Photographs
Hanging Bag Test
North Park Lake Project
U. S. Army Corps of Engineers
Pittsburgh District

Opening of the valve that allows
the water/sediment sample to
flow into the hanging bag.



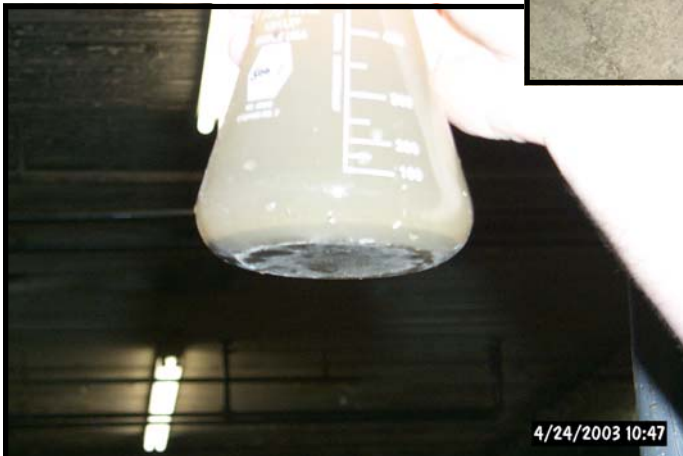
The water/sediment sample has
drained into the hanging bag.



Collection of the bag discharge
for percent solids testing.



Close-up of the effluent
discharge from the hanging bag
after 1 minute.



Photographs
Hanging Bag Test
North Park Lake Project
U. S. Army Corps of Engineers
Pittsburgh District

Water draining from the hanging bag into the collection container.



Collection of the bag effluent for the percent solids testing.



A sample window cut into the side of the hanging bag.